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(54) Title: PROCESS OF PREPARING COMPRESSED PARTIALLY DEHYDRATED VEGETABLES

(57) Abstract

The present invention is related to a process of preparing compressed partially dehydrated vegetables by reducing the water activity level of the vegetables to 0.90 or lower with the moisture content of 15 to 60 % and subjecting said vegetables to compression to form a block with almost no air space between the vegetables thereby producing a stable vegetable product which is stored at temperatures in the range of +8 °C to -30 °C; optionally the vegetables are treated with one or more water activity controlling solute either with one or more water activity controlling solute either before or after dehydration.

Process of preparing compressed partially dehydrated vegetables

Field of the Invention.

The present invention relates to partially dehydrated vegetables that are compressed to minimise storage space and are stored at temperatures within the range of 8°C to -30°C.

Background of tho Invention

Frozen vegetables are important articles of commerce, being used as consumer items, industrial raw materials and in food service. Most vegetables must be held in freezer storage for many months. Production of frozen vegetables occurs usually at a long distance from the point of consumption. There is a considerable world trade in frozen vegetable items and this necessitates long and costly transport by road, ship or aircraft. One of the main problems associated with the frozen food industry is the high cost of frozen storage and transport. The energy cost of freezing vegetables is also considerable.

The common form in which frozen vegetables are produced is as individually quick frozen (IQF) products. With IQF products, the prepared pieces of vegetable are frozen in a low temperature fast moving air stream resulting in individual pieces which are separate and more or less free flowing. This offers convenience in use in that the vegetables can be readily removed from the package, but the air space between the vegetable pieces is considerable and the storage space required is likewise large. Methods have been described which reduce the storage space of frozen vegetables by dehydrofreezing. In such a process, vegetables are dehydrated to as much as about 50% of their original weight (Lazar, ME-1968 "Dehydrofreezing of fruits and vegetables, in Freezing Preservation of Foods - 45th Ed. Vol. 3 P347 AVI Publishing Co.) and thereafter frozen. Dehydrofreezing can reduce freezing, packing, storage and transport costs by up to 60%. The compression of vegetables has been described by Ishler 1965 (Methods of Controlling Fragmentation of dried foods during compression, Technical Report D-13, US Army Natick Laboratories, Natick, Mass.) Constanza et al 1992 (EP0481923A1), Rahman 1978 (US4096283), Rahman 1976 (US 3950560 and US 3984577) and others. Most of the work in the field of compression of vegetables has been directed towards compression of freeze-dried products at pressures of 200-400 lb/in^2 to form a compacted form of dry vegetables at low moisture content for army ration purposes.

A method of partial dehydration has been described whereby vegetables are dehydrated with the addition of solutes so that a product is produced that does not freeze at -20°, and has a lower moisture content than dehydrofrozen vegetables. These products occupy less space

than the dehydrofrozen products (Lewis et al, Aust. Pat 622225, 1989).

Summary of the Invention

The present invention relates to a process of preparing compressed partially dehydrated vegetables which resides in the steps of reducing the water activity level of the vegetables to 0.90 or lower with the moisture content of 15 to 60%; optionally treating said vegetables with one or more water activity controlling solute, subjecting said vegetables to compression to form a solid block with almost no air space between the vegetables thereby producing a stable vegetable product which is stored at temperatures in the range of +8°C to -30°C.

The present invention also relates to a process of preserving a vegetable product by dehydrating the vegetable to a moisture content of about 15% to about 60% (w/w) to produce a product having a water activity of 0.90 or less, compressing the dehydrated product to substantially remove all of the air and reducing the temperature of the dehydrated compressed product to a range ranging from about 8°C to about -30°C.

Water activity controlling solutes or adjuvants such as flavourings, seasonings, colouring agents and preservatives and the like may be added to the vegetables either before or after dehydration and preferably the dehydrated vegetables are packaged in a flexible container and compressed by subjecting the vegetables to a vacuum so that most of the air is removed from the package which is thereafter sealed.

The invention also encompasses a vegetable product consisting of partially dehydrated vegetables either singly or in admixture with a moisture content of 15-60% and a water activity below about 0.90 which has been compressed to remove most of the air therein and is stored at temperatures in the range of +8°C - 30°C.

The present invention is an advance in the art of preserving, storing and transporting vegetables. Products prepared in accordance with this invention can occupy as little as 4% of the space occupied by known IQF vegetables. In use, the vegetables are re-hydrated in a few minutes and are of an excellent quality. Savings in frozen storage and transport costs more than cover the costs involved in dehydration.

Detailed Description of the Invention

It has been found that by dehydrating the vegetable product or pieces thereof to a moisture level of about 15% to about 60% (w/w) and a water activity of 0.90 or below,

followed by compressing the product so as to remove most of the air (and oxygen) therefrom and reducing the temperature of the product to about freezer temperatures produces a product which occupies substantially less space than conventional frozen vegetables and has a longer shelf life than conventional frozen vegetables. Yet, when rehydrated, the vegetable products usually are better tasting and have a better texture than that of conventional frozen vegetables. These products have tremendous advantages in that they are more stable and easier to store and transport, as a result of their smaller size. Most importantly, they usually provide a better vegetable product than conventional frozen vegetables.

The vegetable products described herein may contain one type of vegetable, such as corn, lima beans, broccoli, cauliflower, peas, carrots or they can be an admixture of vegetables, such as peas and carrots, corn and lima beans, etc. The product typically consists of more than one individual piece of vegetable, i.e., it usually contains a plurality of pieces.

The term "freezer", "frozen", or variation thereof as used herein is meant to convey a state where ice and/or solute crystals are normally formed in a product, making it hard and/or brittle.

The term "vegetable" as used herein denotes various types of vegetables, but are not limited to leaves, petioles, roots, bulbs, corms, tubers, etc., as well as fruits and seeds. Examples include, but are not limited to, tomatoes, squash, pumpkin, beans, broccoli, green beans, asparagus, peas, corn, carrots, spinach, cauliflower, lima beans, cabbage, onions, zucchini, eggplant, sweet basil, leeks and the like. In this description, whenever the word vegetable appears, it is to be understood as indicating either whole vegetable or vegetable pieces or morsels. Moreover, the term vegetables refers to both the singular as well as to the plural.

By use of the terms "freezer temperatures", it is meant temperatures that are typically used in freezers. Temperatures preferably range from about 0°C to about -40°C. The term "refrigerator temperatures" is meant to convey normal refrigerator temperatures, such as from about 2°C to about 8°C.

Water activity is a measurement of the amount of water available for chemical reactions in foods, e.g., microbiological spoilage, hydration of colloids, enzyme activity, and the like. It is a measurement of the free water available for chemical reactions. A higher value of water activity signifies that a higher amount of free water is available relative to a lower value. Obviously, the water activity is related to the amount of water present in the foods, but

the relationship is quite complex and non-linear. The expression "a_w" is used to describe water activity by the formula

$$a_w = p/po$$

where p is the vapour pressure of the food and po is the vapour pressure of water at the same temperature. The water activity is dependent upon several factors, such as the amount and types of solids present in the food and the interaction of the solids with the water. Thus, even if two foods contain the same moisture content, the water activity would be different if the solid compositions of the foods are different.

The term "solutes", as used herein, refers to the water activity controlling solutes, as defined hereinbelow.

As used herein, the singular denotes the plural and vice/versa.

In the present invention, it is important to maintain the water activity below a certain level. For example, bacteria grows on food having water activity greater than 0.9. Thus, the water activity of the vegetable products of the present invention must be less than or equal to 0.9.

The vegetable product of the present invention is produced by dehydration followed by compression thereof. The vegetables, prior to dehydration may be peeled, cut, blanched or otherwise prepared in accordance with any customary procedure. More specifically, the present invention involves dehydrating prepared vegetables or vegetable pieces or morsels which have optionally been treated with a water activity controlling solute, to a degree where the water activity of the products is 0.90 or lower and preferably below about 0.85 and most preferably between 0.7 and about 0.85.

The dehydration step removes sufficient amount of water to form a vegetable product that will not crystallise or freeze at freezer temperature and produces a product which is flexible and non-fragile and essentially dry to the touch. If the moisture content is too low, the vegetable product will become hard, fragile and brittle at freezing temperatures. If the moisture content is too high, the vegetable pieces will freeze hard due to the formation of ice crystals; the cell structure of the vegetable will be damaged and the vegetable will become fragile. It is preferred that the moisture content is in the range of about 15% to 60% (w/w) and more preferably between about 20% to 40% (w/w).

The dehydration of the vegetable or vegetable pieces is effected by conventional techniques. The drying may be effected by hot airdrying, vacuum oven drying or

freeze-vacuum dehydration or other conventional techniques. Air drying is preferred, and it can be carried out in various types of air-drying equipment. The temperatures used are those that effectively dehydrate the product, for example, about 100°F to about 180°F.

The degree of dehydration and the concentration of solutes, if present, is adjusted to give a water activity after the dehydration step below 0.90, preferably below 0.85 and a moisture content of about 15% to about 60%, preferably about 20% to about 40%.

The vegetables in this flexible state are then compressed. The vegetables (i.e., various items, pieces or morsels) are compressed so as to remove substantially all of the air from the air spaces therebetween The compression is preferably continued until a substantially solid block containing the vegetables is formed. In a preferred embodiment, about 85% or more of the air is removed from the air spaces. In an even more preferred embodiment, about 95% or more of the air is removed from the air spaces. In the most preferred embodiment there are no air spaces between the pieces of vegetable. The compression of the vegetables is effected by mechanical means, e.g. a cylinder and ram arrangement or press into a substantially solid block. Alternatively, the vegetables are placed in a flexible package and subjected to a vacuum so that most of the air is removed from the package which is then sealed. The latter method is a preferred embodiment. In an even more preferred embodiment, at least 85% of the air is removed In an even more preferred embodiment, at least 95% of the air is removed. Nevertheless, any of the compression methods described herein produces a pack of vegetables in the form of a solid block with substantially no air spaces between the vegetable pieces. When treated in this way. the dehydrated vegetables occupy significantly less space than that of conventional frozen vegetables, i.e. from about 4% to about 20% of the volume of conventional individually quick frozen vegetables. Table 1 gives the relative volumes of 1 kg of some typical IQF vegetables, their equivalent in partially dehydrated but still flexible dehydrated vegetables dehydrated to about 30% moisture and the volume of this dehydrated vegetable when compressed by vacuum packaging.

Table 1

Product	Volume of 1 kg IQF Product	Volume of Dehydrated Product	Volume of Compressed Product of Present Invention	% of space occupied by compressed Product of Present invention compared with IQF
sliced beans	2,500 ml	770 ml	207 ml	8.3%
diced cabbage	3,000 ml	500 ml	117 ml	3.9%
corn kernels	2,000 ml	700 ml	400 ml	20.0%
peas	1,800 ml	750 ml	360 ml	20.0%
shredded carrots	3,160 ml	760 ml	142 ml	4.5%

This methodology described hereinabove results in the substantial elimination of oxygen from the products. In addition, it protects the products from mould and yeast when stored at higher temperatures since they cannot propagate in a substantially oxygen free environment. In a preferred embodiment, water activity controlling solutes are introduced into the product prior to the compression steps or the removal of oxygen by vacuum. They substantially reduce the water activity of the dried product, permitting even greater microbiologically stable intermediate moisture food products to be prepared for storage at freezer temperatures. These products, at a water activity below 0.90, and preferably below 0.85, are quite flexible at ambient temperatures and essentially remain so at freezer temperature. They are microbiologically stable at ambient temperatures for prolonged periods, especially when packaged to remove air, as, for example, when vacuum packaged.

These vegetable products so produced are stable at freezer temperatures and can be stored for prolonged periods of time relative to IQF products. They may be stored at temperatures ranging from 0°C to about -40°C, although it is preferred that they be stored at

temperatures ranging from 0°C to about -30°C and more preferably from 0°C to about -25°C.

The products, because of their low water activity, high concentration of natural or natural and added solutes and low concentrations of oxygen are remarkably stable at low temperatures, bacterial and mould growth being inhibited. At refrigeration temperatures (2°C to 8°C) they may have a shelf life of several months and at freezer temperatures (-15°C to -25°C) have a shelf-life of up to three years.

Water activity controlling solutes, such as salts, may naturally be present in the vegetable. However, in a preferred embodiment, water activity controlling solutes are added to the vegetable product. The water activity controlling solutes are those normally used in the food arts to control water activity. The preferred solutes are salts, sugars and polyhydric alcohols.

The preferred salts are the edible salts and include sodium chloride, sodium citrate, sodium lactate, potassium chloride, potassium citrate and the like.

The sugars include the common monosaccharides and the disaccharides. Examples are fructose, sucrose dextrose, maltose, lactose and high conversion corn syrups, such as corn syrup solids, invert sugars, high fructose corn syrup (>55% fructose content, preferably about 90% fructose content) and the like. The preferred sugars are lactose, dextrose and maltose.

Other water activity controlling solutes include polyhydric alcohols. Preferred polyhydric alcohols are the sugar alcohols, especially the polydextrose sugar alcohols. Examples of polyhydric alcohols include, sorbitol, mannitol, xylitol, glycols such as glycerol, lower alkylene glycols containing 3 - 6 carbon atoms, such as propylene glycol and the like.

These water activity controlling solutes may be used singly or in admixture with other water activity controlling solutes described herein. When present they are preferably present in amounts ranging up to about 10% by weight and more preferably about 2 to about 6% (w/w).

These products of the present invention rehydrate very rapidly because they are at a relatively high moisture content. Furthermore, when present, the solutes induce the rapid absorption of water into the vegetable tissue. These products, because of their low water activity, low concentration of oxygen and, if present, high concentration of natural and/or added solutes are remarkably stable at low temperatures. Bacterial growth and mould growth are inhibited. At refrigeration temperatures (e.g., 2°C to 8°C) they have a shelf-life of several months and at freezer temperatures have a shelf-life of one to three years. Because of their lower water activity, they resist dehydration (freezer-burn) and retain colour and flavour

extremely well. The product can also be reduced to freezer temperatures, such as -20°C, without freezing, thus eliminating the formation of ice crystals which damage the structure of the vegetables. Cost of reduction of temperature to freezer temperatures is also reduced because ice is not produced. Since the products do not freeze, there is no risk of thawing.

The vegetable products of the present invention may additionally be admixed with adjuvants, such as flavouring agents, emulsifiers, colouring agents, preservatives, seasonings and the like. Examples of seasoning agents include sodium citrate, citric acid, and the like. Other adjuvants Include emulsifiers and stabilisers such as guar gum, lecithin, carrageenan, furcelleran, pectin, gellan, methyl cellulose, hydroxypropyl methyl cellulose, locust bean, tragacanth, xanthan, sodium carboxymethylcellulose, and the like. Other adjuvants include food acid flavourings and flavour enhancers (such as monosodium glutamate, 5'-ribonucleotides (such as 5'-inosine monophosphate) and 2-methyl-3-hydroxy-4-(4H-pyrone) and the like), preservatives, colouring agents, seasonings, such as the salts enumerated hereinbelow, and the like.

The water activity controlling solutes and/or adjuvants may be added to the vegetables before, during or after the vegetable pieces are dehydrated by any conventional method. For example, the vegetables may be pre-steeped in solute solution, dry powdered solutes may be dusted onto the vegetables just prior to or during the early stages of dehydration or solute solution may be added to the vegetables during or after dehydration, or by any other method used in this art.

Sugars may be added in low concentrations as flavourings, and other flavourings and seasonings may be optionally added. If necessary, preservatives such as sodium sulfite may also be added. The concentration of salts that are added is dependent on such variables as flavour considerations, the nature of the solutes and the types of vegetables being-treated. The amount of salts that is added is that which is conventionally used. The maximum level is about 10%, but the usual level is about 2% to about 6%. The preferred solute is sodium chloride and the preferred level in the dehydrated vegetables is about 2% to about 6%. As the vegetables are normally cooked in the ratio of one part of vegetables to 20 parts of water, the solute concentration in the vegetables as eaten is quite low. The addition of solutes is not necessary, as the compressed frozen vegetables can be produced without solute addition at all.

The compressed freezer-stored vegetables may be prepared for use by boiling in water. When a block of the vegetables is immersed in boiling water, the rate of water penetration is

surprisingly rapid. Despite the apparent dense nature of the compressed material, the block of vegetables falls apart in an amazingly short time. For most vegetables, this occurs within a minute. Leafy vegetables such as spinach and cabbage are fully rehydrated and cooked in about two minutes or less and other vegetables such as green peas, sweet corn and sliced beans are usually rehydrated and cooked in three to five minutes. The small block of vegetables produces a surprisingly large mass of cooked product ready to serve in this short time.

A study has been made of the energy costs associated with the production, transport, storage and distribution of frozen vegetables. These total energy costs when applied to a range of IQF vegetables (sliced beans, diced cabbage, julienne carrots, chopped spinach, peas and sweet corn) covering production, long distance freight and storage for twelve months at -20°C amounted, on average, to 0.85 Australian dollars per kilogram. For the same range of products produced in the compressed dehydrated form as indicated in Table 1, and allowing for the energy cost of dehydration as well as the costs of freight and storage for twelve months at -20°C, as above, gave an average total cost per one kilogram IQF vegetable equivalent of 0.16 Australian dollars. This indicates that the savings in distribution costs on average for the compressed dehydrated product at -20°C to be of the order of 0.69 Australian dollars per kilogram equivalent. For a frozen vegetable product which may normally sell at retail for $1.00-2.00 per kg, this is a very significant saving.

Additional factors which should be taken into consideration in favour of these compressed dehydrated vegetables over standard IQF vegetables are:

1. Reduced cost of packaging for the compressed vegetables.
2. Reduced supermarket, institutional and home freezer storage space required for the compressed product.
3. Increased shelf-life over IQF products
4. Immunity from thawing and damage from temperature fluctuations during freezer storage.
5. Elimination of freezer-burn in the compressed products.
6. Elimination of frost and ice within the compressed vegetable package.
7. Should the product increase in temperature above 0°C, the product will not spoil and will present no danger to health. The product can be again reduced to freezer temperature without significant damage.

8. Because the dehydrated vegetables used are flexible and not brittle, cuts of vegetable such as thin slices and long thin julienne strips can be prepared without breaking and will not break as they would do when frozen as IQF products.

9. The vegetables prepared according to this method where the products do not freeze have not been damaged by rupture of the cells by ice crystals, and after rehydration, are accordingly of a better texture than traditional frozen vegetables

Unless specified to the contrary, the percentages used herein refer to weight percentages.

The invention will now be described with reference to the following non-limiting examples.

Examples

Examples 1

Cabbage. Savoy variety was cored and diced into 15 x 15 x 15 mm dice. The diced cabbage was blanched in steam for two minutes and dehydrated in a hot air dryer initially at 65°C, then at 55°C until the moisture content was 55%. The cabbage was allowed to equilibrate for about an hour and was then packed in low-oxygen transmission clear laminate bags and vacuum packed and sealed. The cabbage was quite flexible and when vacuum packed formed a solid dense block with no apparent air spaces. The water activity of the cabbage was 0.86. The packed cabbage was stored at -20°c. The cabbage did not freeze but remained flexible.

A 50g block of compressed cabbage was removed from the freezer and placed in a saucepan with a litre of water. The saucepan was placed on a burner and the water brought to the boil. Before the water had boiled the block of cabbage had almost completely separated into its integral pieces, and on boiling 3 minutes the product was cooked and of excellent crisp texture. The 50g block cooked to approximately 380g of cooked cabbage.

Example 2

Carrots. Fresh carrots were peeled and cut into julienne strips 3 mm x 4 mm by approximately 70 mm in length. 500g of carrot strips were blanched in steam for two minutes

and allowed to surface dry for a few minutes. The carrot was then tumbled with 23g of salt, 40g of sugar and 15g of sodium citrate until the powdered ingredients had formed a coating on the carrots. The carrots were transferred to the tray of a hot air dryer and dried at 70°C to a moisture content of 23.7%. The carrot shreds were still quite flexible and had a water activity of 0.71. They contained 3% sodium chloride, 5% of added sugar and 2% of added sodium citrate. The carrots were placed in flexible laminate bags and vacuum packed and sealed. Compact solid packs of carrots were obtained. These were then kept at -20°C. 50g of carrots was removed from the freezer and was cooked as in Example 1. After two minutes boiling, the carrot shreds had separated and were well cooked. No shreds were broken. The 50g block of carrots yielded 300g of cooked shreds.

Example 3

Spinach. 2kg of fresh spinach was well washed and drained, coarsely chopped into approximately 500mm x 500mm pieces and dried in a hot air dehydrator at 70°C to approximately 15% moisture content. At this moisture content the leaves were quite brittle. The spinach was carefully transferred to a slowly rotating drum and sprayed with 46 ml of a saturated sodium chloride brine. The spinach quickly absorbed the brine and became quite flexible. It was vacuum packed in a similar way to the carrots and cabbage and stored at -20°C. The spinach had a salt content of 5%, a moisture content of 33% and a water activity of 0.78. 50g of the compressed spinach was removed from the freezer and cooked in a similar way to the carrots. The spinach was fully cooked after boiling for one minute and the leaf pieces were separate and essentially unbroken compared to the original cut pieces. The cooked spinach weighed 340g.

Example 4

Carrots. Carrots were prepared as described in Example 2 except that instead of vacuum packaging, the semi-dried carrots were placed in 100g batches in a cylinder of 7 cm diameter equipped with a ram and compressed at 50 kg per cm^2. The block of carrots so formed was cooked in 20 times its weight of water. After 2 minutes boiling the carrot shreds were completely separate and well cooked.

Example 5

Sweet corn. Sweet corn kernels of a "super-sweet" variety were cut from the cob, steam blanched for three minutes and dehydrated in a hot air dryer at 70°C until the water activity of the corn was 0.84 and the moisture content 25%. The corn was dry to the touch but still somewhat "rubbery". The corn was vacuum packed 50g to a pouch made from low oxygen transmission flexible film, sealed and stored at -20°C. A 50g pack of corn was later removed from the freezer and cooked in 30ml of boiling water. The compressed corn had separated within a minute of immersion and was well cooked in five minutes.

The above preferred embodiments and examples are given to illustrate the scope and spirit of the present invention. The embodiments and examples described herein will make apparent to those skilled in the art other embodiments and example. These other embodiments and examples are within the contemplation of the present invention. Therefore, the present invention should be limited only by the appended claims.

CLAIMS

1. A process of preparing compressed partially dehydrated vegetables which resides in the steps of reducing the water activity level of the vegetables to 0.90 or lower with the moisture content of 15 to 60%; optionally treating said vegetables with one or more water activity controlling solute, subjecting said vegetables to compression to form a block with almost no air space between the vegetables thereby producing a stable vegetable product which is stored at temperatures in the range of +8°C to - 30°C.

2. A process as claimed in claim 1 wherein said vegetables are reduced to a water activity level of 0.85 or lower at 20°C and a moisture content of 15 - 60%, preferably about 20 - 40%.

3. A process as claimed in claim l or 2 wherein said vegetables are compressed by mechanical means.

4. A process as claimed in claim I or 2 wherein said vegetables are compressed by placing said vegetables in a flexible package which is subjected to a vacuum to expel most of the air and thereafter sealing said package.

5. A process as claimed in claim 1 wherein the water activity controlling solutes are added to said vegetables before during or after dehydration by steeping said vegetables in a solution containing said solutes or dusting said solutes in a powdered form onto said vegetables or by adding a solution containing said solutes directly onto said vegetables during or after dehydration.

6. A process as claimed in claim 1 wherein the water activity controlling solutes comprises sodium chloride, sodium citrate or other edible salts, sugars and polyhydric alcohols, singly or in admixture.

7. A process as claimed in claim 6 wherein 2% - 6% sodium chloride is added to said vegetables.

8. A process as claimed in claim l wherein flavourings, seasoning agents and preservatives are singly or collectively included with said water activity controlling solutes.

9. A vegetable product consisting of partially dehydrated vegetables singly or in admixture with a moisture content of 15 - 60% and a water activity below about 0.90 which has been compressed to remove most of the air therein and is stored at low temperature in the range of +8°C to -30°C.

10. A vegetable product as claimed in claim 9 wherein said vegetables are reduced to a

water activity level of 0.85 at 20°C and a moisture content of 15 - 60%, preferably about 20 - 40%.

11. A vegetable product as claimed in claim 9 wherein said vegetables are compressed by mechanical means.

12. A vegetable product as claimed in claim 9 or 10, wherein said vegetables are compressed by placing said vegetables in a flexible package which is subject to vacuum to expel most of the air and thereafter sealing said package.

13. A vegetable product as claimed in claim 9 wherein the water activity controlling solutes are added to said vegetables before during or after dehydration by steeping said vegetables in a solution containing said solute or by dusting said solutes in powdered form onto said vegetables or by adding a solution of said solutes directly onto said vegetables.

14. A vegetable product as claimed in claim 9 wherein the water activity controlling solutes comprises sodium chloride, sodium citrate, sodium lactate or other edible salts, sugars and polyhydric alcohols, singly or in admixture.

15. A vegetable product as claimed in claim 14 wherein 2 to 6% sodium chloride is added to said vegetables.

16. A vegetable product as claimed in claim 9 wherein flavourings, seasoning agents and preservatives are singly or collectively included with said water activity controlling solutes.